MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2018/2019

EEE1036 – DIGITAL LOGIC DESIGN

(All sections / Groups)

28 MAY 2019
2.30 p.m. – 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **FOUR** pages including cover page with **FOUR** questions only.

2. Answer **ALL** questions and print all your answers in the answer booklet provided.

3. All questions carry equal marks and the distribution of the marks for each question is given.

Question 1

(a) Describe the concept of a signal, then state its relationship with physical quantities. [4 marks]

(b) List **three** advantages of a digital system over an analog system. [6 marks]

(c) Find the equivalent of hexadecimal number FADE.58_{16} in the following bases. Show the working steps for each conversion.

(i) Base-2 [1 mark]

(ii) Base-8 [1 mark]

(iii) Base-10 [2 marks]

(d) Convert the given codes in **Table Q1(d)** to other specific number representations listed. Reproduce the table in your answer sheet. [6 marks]

Table Q1(d)

BCD	Decimal	Binary	Gray code
			11010101
10010110			

(e) Perform the following operations in 8-bit two's complement notation for both the operands and result. Comment on the discrepancy, if any.

(i) Add -37 to 95 [2 marks]

(ii) Subtract 43 from -88 [3 marks]

Question 2

(a) Simplify the following Boolean expression below:

$$F = ((AB' + ABC)' + A(B + AB'))'$$ [5 marks]

(b) For the given Boolean expression below, modify the expression using DeMorgan's Theorem to a NAND gate only implementation, and then draw the logic circuit for this implementation. Label the corresponding input and output clearly.

$$X = AB + CD$$ [5 marks]

(c) Determine the minimum **Sum-of-Product** (SOP) form for the following functions with don't cares condition using Karnaugh map.

$$f(A,B,C,D) = \sum m(4,7,9,15) + d(1,2,3,6)$$ [6 marks]

(d) Minimize the following functions using the Quine-McCluskey method. List all possible minimized solutions.

$$f(A,B,C,D) = \sum m(4,5,6,8,11,13,15)$$ [9 marks]

Continued...

Question 3

(a) Redraw the given clock with edge triggered of J-K input in **Fig. Q3(a)** and complete the **Q** output waveform response for positive edge-triggered J-K flip-flop. Assume the initial condition for **Q** is low. [3 marks]

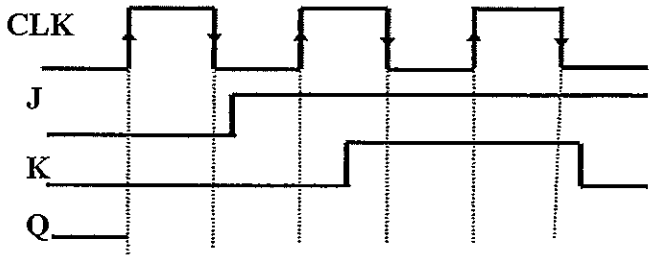


Fig. Q3(a)

(b) Draw the timing diagram of the clock **(CLK)** and complete the signals, Q_0 **and** Q_1 of the counter shown in **Fig. Q3(b)** for **6 clock pulses**. Assume the initial condition for all Q is low. [6 marks]

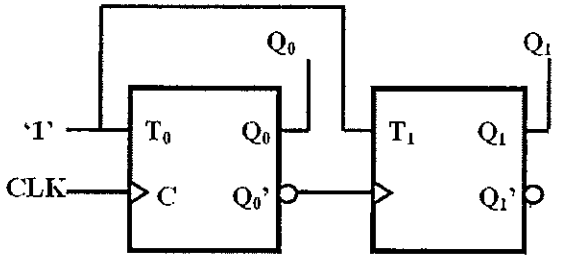
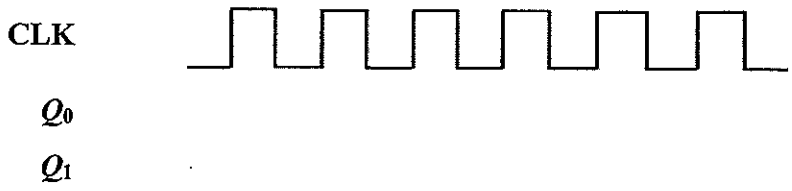


Fig. Q3(b)



(c) A synchronous counter using negative-edge triggered J-K flip-flops has the following counting sequence:

0, 1, 2, 5, 7, 0, 1... repeats.

(i) Develop a next state table for the counter sequence. [5 marks]

(ii) Produce Karnaugh maps and logic expressions for flip-flop inputs for a three-bit counter using J-K flip-flops transition truth table. [9 marks]

(iii) Sketch the counter to produce the specified sequence of state. [2 marks]

Continued...

Question 4

(a) How does an encoder differ from a decoder? [2 marks]

(b) Implement $F(X,Y,Z) = \sum m(2,4,6,7)$ using each of the following:

(i) 1-to-8 demultiplexer with active high outputs and an OR gate [4 marks]

(ii) 1-to-8 demultiplexer with active low outputs and an AND gate [6 marks]

(iii) 3-to-8 decoder with active low outputs and a logic gate [5 marks]

(c) Design a circuit using a 4-to-1 multiplexer, such that an indicator will light up under these conditions:

- If the function button C is not pressed (C = 0) and A > B.
- If the function button C is pressed (C = 1) and A = B. [8 marks]

End of Paper